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Loss of water from Martian surface and depletion of atmospheric CO₂

Discovery of life on any other planet will undoubtedly be one of the greatest achievements in human history, and is the prime underlying motivation for exploratory spacecraft missions to Mars. These expeditions have revealed that water is absent on the Martian surface and very low in abundance in the form of ice, but have discovered surface features strongly reminiscent of dry river valleys and dry sea trenches. The atmosphere of Mars consists mainly of CO₂ (95.32%) with lesser amounts of N₂ (2.7%), Ar (1.6%), O₂ (0.13%), CO (0.07%) and H₂O (0.03%). Mars has very low atmospheric pressure at its surface, amounting to just about 0.7% of that of Earth. Liquid water cannot presently exist on the Martian surface, because at such a low atmospheric pressure, it would evaporate. So, if certain surface features of Mars were really formed by flowing liquid water, then two fundamental questions arise: What became of the water and what became of the more dense-atmosphere?

The popular prevailing theory of Martian water and atmosphere loss, is based upon the idea that the Martian atmosphere was eroded away into space by the solar wind. But to have such severe atmospheric erosion, the solar wind would have had to have been considerably more intense in the distant past after formation of flowing-water-sculpted surface features. One might wonder what effect such a superintense solar wind might have had on the Earth, as there it would have been about 2.3 times even more intense at the region of the Earth's orbit. I suggest instead that the loss of Martian surface water and atmosphere were related to the decrease in Martian internally produced energy.

There is evidence that Mars was geologically active at some time in its past. It had an internally produced magnetic field, volcanoes, and possibly even some apparent crustal mobility, all of which are indicative of internal energy production. By analogy with the Earth, one might expect Martian internal energy sources to be energy from natural radioactive decay, from nuclear fission of uranium and, perhaps, from protoplanetary energy of compression. Although natural radio-active elements decay at well known rates, the latter could potentially have exhausted themselves, leaving Mars a dying planet and beginning the end of the repeated cycling of water between subsurface and atmosphere.

The effect of decreased internal heat production on Mars and the resulting decreased heat flow from the surface would have two consequences. Water would increasingly be retained beneath the surface, perhaps hydrating some of the minerals, and there would be a tendency toward greater dissolution of atmospheric CO₂ and greater deposition and formation of carbonate minerals. The consequence of decreased internal energy production would thus deplete the atmosphere of CO₂, which would in turn decrease the greenhouse effect, further cooling the atmosphere. That such a process might deplete the Martian atmosphere of CO₂ can be appreciated by recalling the fact that the Earth's oceans contain fifty times as much carbon in the form of dissolved inorganic carbon than does the atmosphere in the form of CO₂.

The twin mysteries of the loss of Martian surface water and the loss of the Martian atmosphere may, I submit, have a common origin related to the diminishment of the internally produced energy of Mars.


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Phonetic pharmaceutical brands causing havoc in the healthcare system

These days pharmaceutical companies' marketing strategies seem to outweigh practical deliberations while naming a brand. Our country has more than a lakh of brands for just about 300 drugs. Most of the brands are either similar looking or sound alike and are used for different ailments. There are instances wherein the composition of the brand is changed with a slight change in the brand name. A few examples for look-alike and sound-alike brands are Cælih and Celin; the former is a pain-killer and the latter is a vitamin. Similarly, Trip is a tranquilizer and Triz is an anti-allergic drug; so also Etoxin is an antibiotic and Etoxin is used to treat hypothyroidism. A well-known example for misbranding is Disprin Plus. Disprin of Reckitt Benckiser has been well-established aspirin brand in the Indian pharmaceutical market for a long time. With a harsh price cut of aspirin by National Pharmaceutical Pricing Authority in early 2001, the company ceased to manufacture its products but did not give up its renowned brand name. The company has launched Disprin Plus which contains paracetamol as the only ingredient. Change of composition poses serious problems in the pharmaceutical market. Such brands are creating confusion among physicians and chemists. Most of the pharmaceutical companies are not concerned with the
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mayhem on healthcare caused by such branding.

Faulty dispensing due to the confusing brand names can lead to therapeutic failure or even cause death of a patient. In the United States, it has been estimated that look-alike and sound-alike drug names are responsible for approximately 25% of medication errors. In spite of qualified dispensers, medication errors are large in number in the United States. So one can imagine the status in our country, where dispensing of medicines is done by unqualified personnel many-a-time.

Avoiding confusion by phonetic brands is not a difficult task if adequate care is taken while naming the brands, prescribing and dispensing. Pharmaceutical companies must make an unselfish effort to give a distinct brand name. Physicians must be careful with their handwriting. It would be appropriate if they can mention the brand name of the drug in capitals and the generic name within parentheses. Chemists and druggists should always refer back to the physician in case of any doubt and should update their knowledge about new brands introduced in the market. It is surprising to know that it is not mandatory to get approval for and register brand names with any central authority in India and there are no legal restrictions on use of old established brand names by firms even after some ingredients are altered. Drugs Controller General, India (DCGI) should take an initiative to set-up a central authority to monitor registration of trade names and create a database of the brand names which should be updated on a regular basis.


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Biodiversity loss linked to poverty

The responsibility of mankind for future generations is to leave a world rich in biodiversity, filled with plants, animals, and ecosystem processes on which all living things depend. Unfortunately threats to biodiversity are high, caused by detrimental human activities across the globe. The pressures from urbanization, mass tourism and intensive agriculture have pushed more and more native species towards extinction. One by one, the building blocks of entire ecosystems are disappearing. The 2006 IUCN Red List shows that the number of threatened plant species is increasing gradually (http://www.iucnredlist.org). The number of threatened plants is 8390, out of which 247 plants are found at different biodiversity hotspots of India. The loss of species is an indication of the degraded state of our planet. In my opinion, poverty is the root cause of biodiversity loss. Nature conservation programmes can never be successful if poverty plagues the country.

Poor people, especially those living in areas with low agricultural productivity, rely heavily and directly on genetic species and ecosystem biodiversity to support their livelihoods. Poor farmers are not capable of investing in farm improvements to increase yields sustainably. Low farm productivity leads to depletion of soil and water resources, and forces farmers to utilize additional land that serves as wildlife habitat. Thus lack of alternative income drives them to over-exploit natural resources. This overuse of biodiversity cannot be reduced unless efforts are clearly linked to increasing food security for large and growing low-income, food-insecure populations. Efforts should be made to mobilize and support local people to conserve areas of high biodiversity, and thereby improve the natural resource assets of rural populations. By engaging local people to conserve biodiversity that are critically important to their livelihoods, a broad-based, long-term strategy can be formulated for conservation of globally threatened biodiversity.

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Plight of botany practicals in universities

Higher education in science, particularly in botany, cannot be accomplished without sound practical knowledge. Teaching theoretical aspects is one thing but creating appreciation in the pupil’s mind towards the subject can only be done by practical work. The scenario of botany practicals in Indian universities is very grim and worth attending to.

Deterioration starts early at 10 + 2 level itself as suggested by Paliwal; lack of interest towards practicals persists in students from school itself, which they carry on when they come to higher education. It becomes difficult for disinterested and untrained students to sustain rigorous practicals at the undergraduate level. Further, in-depth knowledge and